# Technologies to improve in vivo function of transplanted stem cells

## Grant Award Details

Technologies to improve in vivo function of transplanted stem cells

**Grant Type:** Tools and Technologies III

**Grant Number:** RT3-07907

**Project Objective:** To develop technologies to promote in vivo survival and differentiation of transplanted cells to treat skeletal muscle impairments.

**Investigator:**

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| **Name:** | Shyni Varghese |
| **Institution:** | University of California, San Diego |
| **Type:** | PI |

**Disease Focus:** Skeletal/Smooth Muscle disorders

**Human Stem Cell Use:** Embryonic Stem Cell, iPS Cell

**Award Value:** $1,393,200

**Status:** Active

## Progress Reports

**Reporting Period:** Year 1

**View Report**

## Grant Application Details

**Application Title:** Technologies to improve in vivo function of transplanted stem cells

**Public Abstract:** Stem cell-based therapy is recognized as a promising therapeutic approach for treating various diseases that are currently intractable. One strategy in regenerative medicine is to transplant stem cells or their differentiated derivatives to regenerate the damaged tissues or halt tissue degeneration. Human embryonic stem cells and human induced pluripotent stem cells having the potential to differentiate into every cell in the human body are highly promising sources of tissue specific cells. Despite the tremendous promise, current stem cell-based therapies suffer from low survival of transplanted cells and limited functional integration of the cells that do survive. In this research program, we address this bottleneck in cell-based therapy by developing tools and technologies to improve the in vivo differentiation, long-term survival, and integration of transplanted cells. Specifically, we will develop clinically translatable biomimicking materials and micro- and nano-technologies to improve the outcome of cell transplantation therapies. A successful cell transplantation therapy that contributes to tissue regeneration, restoring normal tissue function and homeostasis, and halting tissue degeneration will create a new paradigm in cell-based regenerative medicine. For instance, the global stem cell market is forecasted to reach roughly US $63.8 billion by 2015 and technologies such as the one developed here will be a vital component in making this forecast a reality.

**Statement of Benefit to California:** The generous investment of California citizens into stem cell research has made significant advancements in this field. These efforts have substantially improved our understanding of stem cell biology and our ability to differentiate these cells into targeted cell types. However, the technologies to culture and generate large number of stem cells are only one step towards cell-based therapies and the therapeutic outcome of cell-based therapies is dependent upon the ability of the transplanted cells to survive, migrate, and integrate with the host tissue. The proposed research program seeks to develop novel biomimetic materials and micro- and nano-technologies to improve the survival, migration, integration, and the function of transplanted stem cells. The proposed project will benefit the state of California by: (i) improving the efficacy and efficiency of stem cell-based therapies, (ii) maintaining California's technological leadership in the field of stem-cell technology as well as its applications in healthcare, (iii) training a highly educated and interdisciplinary work force in biomedical sciences, and (iv) contributing to California's economic leadership by translating technological advancements into commercial applications. The principal investigator and collaborators have a strong record of translating the technologies developed in their laboratory to practice through the formation of startups, and through interactions with industry, particularly within California.

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